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## THE NEURAL GLAND IN ASCIDIA ATRA.

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JULIN and Herdman have described in *Phallusia mammillata* a very interesting condition of the neural gland. Instead of having a single large anterior opening (the ciliated funnel), the gland in this species has many small lateral openings connected by small branched tubes with the main duct. The ciliated funnel is always small, and frequently the duct of the gland does not extend far enough forward to open into it. The many small lateral openings lead into the peribranchial cavity.

Roule has described a similar condition in *Ascidia Marionii*. This species has numerous lateral openings from the duct of the gland into the peribranchial chamber, and also has a reduced ciliated funnel, the latter, however, always being connected with the duct of the gland.

I have recently found somewhat similar relations in *Ascidia atra*, from Jamaica, W. I. I have had for examination only two specimens of this species, but as they agree in the character of the parts to be described, there is no room to doubt they are normal characters.

*Ascidia atra* is a large black ascidian, shaped much like *A. mentula*. Its ganglion and subjacent gland lie far back of the ciliated funnel, as is the case in all the *Ascidias*. The gland is of enormous size, underlying the whole of the much-elongated ganglion and projecting in front of the latter a distance equal to seven-eighths the length of the ganglion (*cf.* Fig. 1). The gland is also of great width and of still greater depth, pushing down into the dorsal lamina, whose upper part is enlarged to accommodate the glandular tissue (*cf.* Fig. 2). None of the sixty species of tunicates I have studied show a gland whose size in relation to that of the body is so great.

The duct of the gland shows several features of special interest. The main duct extends from near the posterior end of the gland, over its dorsal surface, and forward to the ciliated funnel,

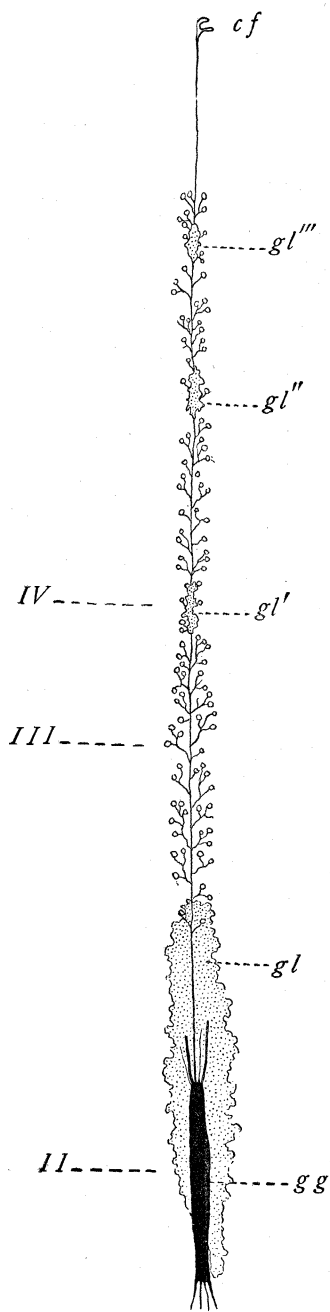
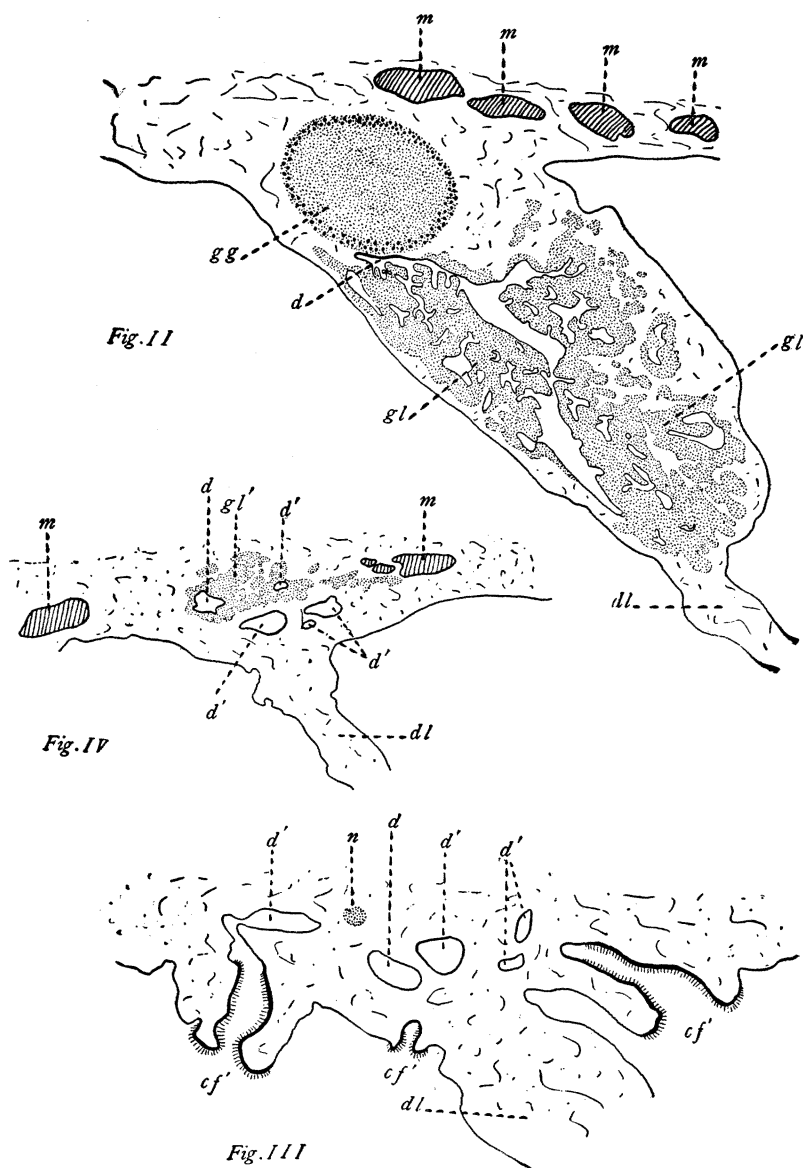


FIG. 1.

which is of normal size and presents the common horseshoe-shaped appearance. At three distinct points the main duct is associated with a considerable mass of glandular tissue, as shown in the accompanying figures (1 and 4) at  $gl''$ ,  $gl'''$ , and  $gl''''$ . The larger neural gland lies ventral to the duct, opening into it dorsally by very numerous openings; in fact the ventral wall of the duct in this region can hardly be said to be present at all. The three accessory glands, on the other hand, surround the main duct, opening into it from all sides (*cf.* Fig. 4).

Between the anterior end of the large gland and the most anterior of the accessory glands the duct gives off numerous branches, which usually rebranch from one to five times, each twig ending in a little ciliated funnel that opens into the peribranchial chamber (*cf.* Figs. 1, 3). There are one hundred and sixteen of these accessory funnels in one specimen, and nearly the same number in the other specimen. Each funnel has a round aperture with flaring lips, the whole appearance being much like that of the accessory funnels in *Phallusia mammillata*, except that the red pigment connected with the accessory funnels in the latter species is wanting in *A. atra*.

It is interesting to note that the



# EXPLANATION OF FIGURES.

- FIG. 1.—Dorsal view of ganglion and neural gland with its duct.  
 FIG. 2.—Cross section through ganglion and neural gland at the point marked II in Fig. 1.  
 FIG. 3.—Cross section through the duct of the neural gland at the point marked III in Fig. 1.  
 FIG. 4.—Cross section through one of the accessory glands at the point marked IV in Fig. 1.  
 Fig. 1 is a reconstruction from serial sections, and is magnified about nine times.

dorsal tubercle of *A. atra* is well developed, being of large size and presenting the usual horseshoe-shaped appearance. In *A. Marioni* and *Ph. mammillata*, the only other species having accessory funnels, the dorsal tubercle is much reduced. In *Phallusia* it may even be wholly absent, or at least so small as to be indistinguishable from the accessory funnels. I have not studied *A. Marioni*, but according to Roule's description the tubercle in this species can always be distinguished by its size, though not by its shape, from the round accessory funnels.

*A. atra* is unique in the following points: (1) in the great size of its neural gland; (2) in the possession of three accessory glands along the duct of the neural gland; (3) in the association in the same individual of a well-developed dorsal tubercle with numerous accessory funnels. This species agrees with *A. Marioni* and *Ph. mammillata* in the possession of numerous lateral branches of the neural duct, each opening by one or more ciliated funnels into the peribranchial chamber.

The discovery of the character of the neural gland and its openings in *A. Marioni* and *A. atra* I believe argues strongly against the isolation of *Ph. mammillata*. The agreement between these three species in so remarkable a character indicates, I believe, that the three are more nearly related to each other than either is to the other *Ascidiae*. If, then, classification is to express relationship, we should either return *Phallusia* to the genus *Ascidia*, or separate *A. atra* and *A. Marioni* from the other *Ascidiae*, including them under the genus *Phallusia*.

FROM THE BIOLOGICAL LABORATORY OF  
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REFERENCE LETTERS.

*cf* = ciliated funnel.  
*cf'* = accessory ciliated funnel.  
*d* = duct of neural gland.  
*d'* = branch of duct of neural gland.  
*dl* = dorsal lamina.

*gg* = ganglion.  
*gl* = neural gland.  
*gl', gl'', gl'''* = accessory glands.  
*m* = longitudinal muscle of intersiphonal region.  
*n* = nerve.